RESTING ENERGY EXPENDITURE OF PATIENTS AFTER GYNAECOLOGICAL OPERATION IN SINGAPORE

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SUMMARY

Energy cost of rest was estimated in pre-operative and post-operative periods in 9 patients after minor, 4 patients after moderately severe and 2 patients after major gynaecological operations. They were tested on different days up to the day of discharge.

The resting energy cost (kcal* /min) increased by 6 to 12% in the 1st group, 2 to 26% in the 2nd group during first 3-4 days followed by slight drop. In the 3rd group with major surgery the resting energy cost increased initially followed by drop from 4th to 17th days post-operatively. These increases were partly independent of the increase of body temperature.

The respiratory quotient decreased slightly in the immediate post-operative period in the 1st and 2nd groups of patients. In the 3rd group the respiratory quotient increased in the post-operative period.

The estimated average extra calorie intake in the post-operative period has been recommended as 200 kcal per day, for tropical people.

Nutrition in the post-operative period is of prime importance for adequate recovery. Cuthbertson (1932) reported high oxygen consumption in patients with fracture of the lower limb. In a similar study Cuthbertson (1932) recorded an increase of resting energy consumption up to 110-120% after elective surgery in two patients. Cope *et al* (1953) reported increase in metabolic rate in patient of burns which was proportional to the extent of burnt surface. Kenney (1960) and his co-workers have obtained a reliable estimate of 2000-2500 kcal/day in the preoperative period and they suggested a slight increase in the post-operative period. Barr *et al* (1968) studying oxygen consumption in burned patients at 32°C and 22°C noted that in higher temperatures there was a substantial decrease of basal metabolism. Tilstone and Cuthbertson (1970)

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* In S.I. Units, 1 kcal = 4'186 Kilo-Joules

also reported similar findings.

It has now been established that energy expenditure in tropical people is lower than their western counterparts (Banerjee & Saha, 1970; 1972; Banerjee, Khew and Saha, 1971). But there is no information regarding energy expenditure in female subjects under surgical trauma in tropical countries. It was, therefore, thought worthwhile to study the resting energy expenditure after gynaecological operation, which might help in the management of such cases.

Subjects

15 women consisting of 13 Chinese and 2 Indians aged 17 to 44 years, undergoing gynaecological operations without any post-operative complications in Kandang Kerbau Hospital, Singapore, were selected at random. These patients formed three groups:-

Group I consisted of 9 patients undergoing minor operations requiring 6 days of hospitalization;

Group II consisted of 4 patients requiring 9 days hospitalization after operation;

Group III consists of two patients requiring 17 days of hospitalization after operation.

EXPERIMENTAL

The subject's height and weight were recorded in light clothing, in the pre-operative and on the day of discharge from the hospital. The room temperature in the hospital varied between 27°C to 29°C. Pulse rate, oral temperature and blood pressure were measured in the pre-operative period for three days in the morning. After operation pulse rate and oral temperature were recorded every day until the patient was discharged. Resting oxygen consumption in the supine position was measured on three pre-operative days and daily in post-operative period excepting 5th day using a Max Planck respirometer and Lloyds gas analysis apparatus. The details of the method and the precautions that were adopted have been described earlier (Banerjee and Saha, 1970). All the measurements were taken in the morning in the post-absorptive period. Gas analysis was estimated in duplicate and average energy cost was taken as final result. The average of three days result was taken as the final result of the pre-operative period.

Results and Discussion

Results are presented in Tables I-III and figures 1-3. Table I-III show the average resting energy cost, body temperature (oral), pulse rate, the percentage variations of energy cost and the variations of body temperature and pulse rate from the pre-operative values in three groups of patients respectively. Figures 1-3 show the average resting energy cost, body temperature, pulse rate and the respiratory quotients for the three groups of patients respectively.

TABLE I: Resting Energy Cost, Body Temperature and Pulse Rate of 9 Patients After Gynaecological Operations

	Energy Cost* (k cal/min)	% Variation from preoperative	Body Temperature* (F°)	Variation from preoperative	Average Pulse (per min)	Variation from preoperative
Pre-operative	0.83 ± 0.08	—	98.4 ± 0.12	—	82.6	—
POSTOPERATIVE 1st day	0.92 ± 0.15	+ 10.8	99.3 ± 1.56	+ 0.9	87.9	+ 5.3
2nd day	0.93 ± 0.09	+ 12.5	98.9 ± 1.02	+ 0.5	85.3	+ 2.7
3rd day	0.89 ± 0.16	+ 7.2	98.0 ± 0.06	—0.4	85.3	+ 2.7
4th day	0.88 ± 0.15	+ 6.0	98.5 ± 0.65	— 0.1	83.4	+ 2.8
6th day	0.78 ± 0.12	— 6.2	98.1 ± 0.73	—0.3	81.2	—1.4

*(mean ± S.D.)

Age (yrs) = 17—44

Average height (cm) = 153.3

Average blood pressure (mmHg) = systolic — 116.0
diastolic — 74.4

Average body weight (kg) = preop — 48.8 ± 6.5
Discharge — 47. 7 ± 6.3

TABLE II: Resting Energy Cost, Body Temperature and Pulse Rate of 4 Patients After Gynaecological Operations

		Energy Cost* (kcal/min)	% Variation from preoperative	Body Temperature* (F°)	Variation from preoperative	Average Pulse Pulse (per min)	Variation from preoperative
Pre-operative		0.88 ± 0.08	—	98.4 ± 0.11	—	84.0	—
O							
S	1st day	1.07 ± 0.06	+ 21.6	99.8 ± 1.57	+ 1.4	87.7	+ 3.7
T	2nd day	0.90 ± 0.01	+ 2.2	99.5 ± 1.37	+ 1.1	89.0	+ 5.0
O	3rd day	1.11 ± 0.16	26.1	98.0 ± 0.00	— 0.4	85.3	+ 1.3
P	4th day	0.83 ± 0.13	— 5.7	98.7 ± 0.64	+ 0.3	85.0	+ 1.0
E	6th day	0.80 ± 0.16	— 9.1	98.2 ± 0.23	—0.2	81.7	—2.3
R	7th day	0.85 – 0.11	— 3.4	98.3 ± 0.22	—0.1	81.7	—2.3
A							
T	8th day	0.82 ± 0.03	— 6.8	98.0 ± 0.40	—0.4	82.5	—1.5
I	9th day	0.79 ± 0.15	—10.2	98.2 ± 0.90	—0.2	82.0	—2.0

*(mean ± S.D.) Age (yrs) = 28—42
Average height (cm) = 151.5
Average blood pressure (mm Hg) systolic — 123.5
diastolic — 82.5
Average body weight (kg) preop — 51.5 ± 10.2
discharge — 50.5 ± 10.6

TABLE III: Resting Energy Cost, Body Temperature and Pulse Rate of 2 Patients After Gynaecological Operations

	Energy Cost* (kcal. min)	% Variation from preoperative	Body Temperature* (F°)	Variation from preoperative	Average Pulse (per min)	Variation from preoperative
Pre-operative	.94	—	98.3	—	85.0	—
1st day	1.05	+12	99.5	+0.2	89.0	+4.0
2nd day	0.91	— 3	100.0	+1.7	90.0	—5.0
3rd day	1.20	+28	98.0	—0.3	85.0	0
4th day	0.77	—18	99.2	+0.9	85.0	0
6th day	0.79	—16	98.4	+0.1	81.5	—3.5
7th day	0.79	—16	98.4	+0.1	81.0	—4.0
8th day	0.79	—16	97.7	—0.6	80.0	—5.0
9th day	0.71	—14	97.9	—0.3	82.5	—2.5
11th day	0.80	—15	97.7	—0.6	80.0	—5.0
13th day	0.80	—15	98.2	—0.1	83.5	—1.5
14th day	0.77	—18	—	—	—	—
15th day	0.84	—11	98.0	—0.3	82.0	—3.0
17th day	0.98	+ 4	98.0	—0.3	80.0	—5.0

Age (yrs) = 34, 42
Average height (cm) = 154.0
Average body weight (kg) = preop — 57.1
discharge — 53.2 *(average)

Average blood pressure (mm Hg) systolic — 127.0
diastolic — 85.0

The pre-operative resting energy costs of 1st and 2nd groups of patients were respectively 0.83 and 0.88 kcal/min, which compares favourably with the values of our earlier series of nonpregnant women (Banerjee *et al*, 1971). There was an increase of 11 & 12 per cent of the pre-operative value on 1st and 2nd post-operative days and 6-7 per cent on 3rd and 4th post-operative days in the first group of patients but the difference was significant (P - < 0.01) only on 3rd post-operative day. Then it came down to -6 percent on the 6th post-operative day. There was an increase of temperature and pulse rate on the first two days which could only partly explain the energy increase. On the following two days there was an increase of energy cost inspite of a slight drop of temperature and pulse rate. In the 2nd group of four patients (Table II), it is noted that the pattern of the variations of energy cost, body temperature and pulse rate was the same as in the first group, but the increases of energy cost were 22 and 26 per cents on the 1st and 3rd post-operative days, whereas there was only 2 per cent increase on the 2nd day. There was 3-10 per cents decrease of energy cost between 4th and 9th post-operative days. The energy cost was significantly higher only on the 1st and 3rd post-operative days. On other days the difference was not statistically significant.

From figures 1 and 2 it is seen that there was a slight drop of respiratory quotients in both the groups on 1st and 2nd post-operative days, which may be due to the mobilization of body fat during this period. The drop of energy cost on the 2nd post-operative day in the 2nd group can not be explained.

Table III shows the changes in cases of major elective surgery in two patients. The pre-operative resting energy cost was 0.94 kcal/min which was higher than the previous two groups. This can be explained by higher weights of these two patients. The percentage increases were 12 and 28 per cents on the 1st and 3rd post-operative days. The energy costs decreased to 3 per cent below the preoperative value on the 2nd day, as in the 2nd group. It remained 11-18 per cents below the pre-operative value between 4th and 15th days, coming back slightly above (4 per cent) the pre-operative value on the 17th day. The variations of body temperatures and pulse rates were more or less the same as in the other two groups of patients. However, the respiratory quotients remained unchanged for the first two days, then remained high

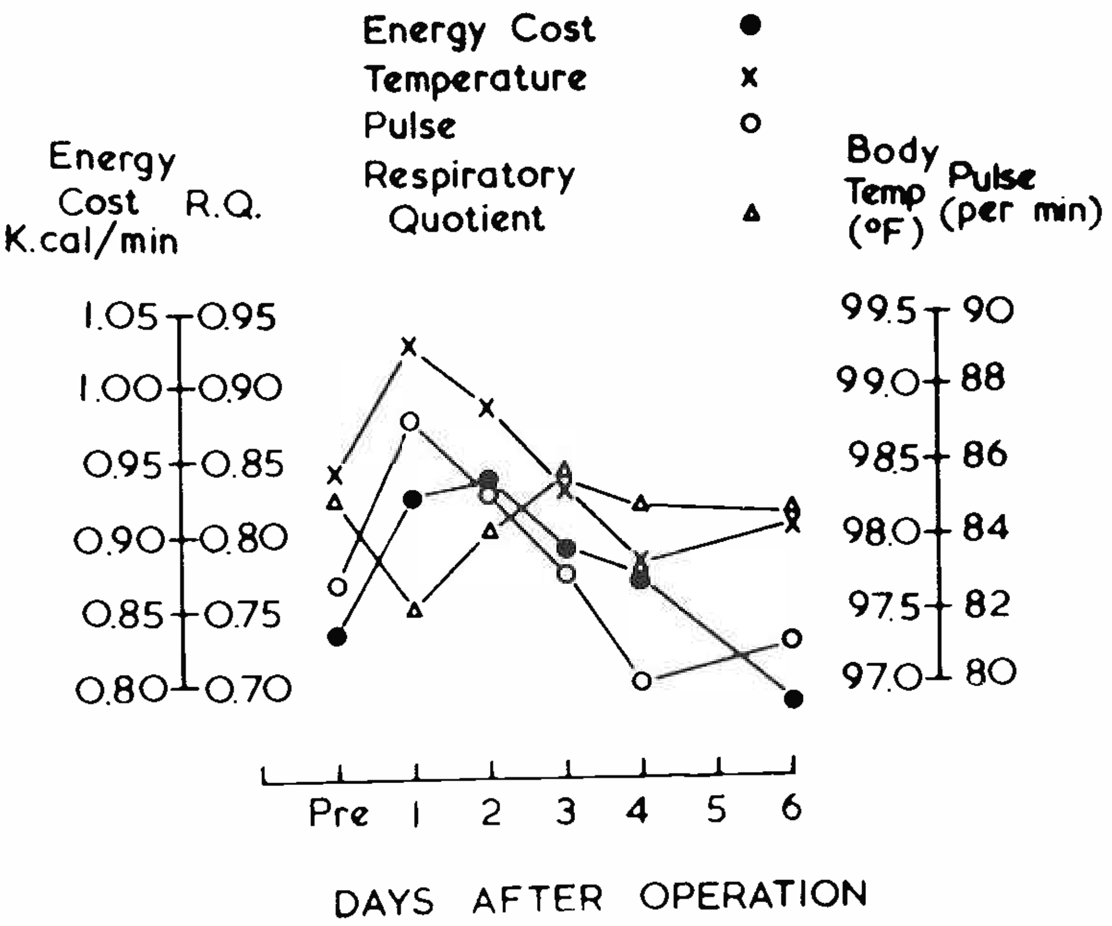

Fig. 1. Energy cost (rest), body temperature, pulse rate, respiratory quotient after operation. (average of 9 patients).

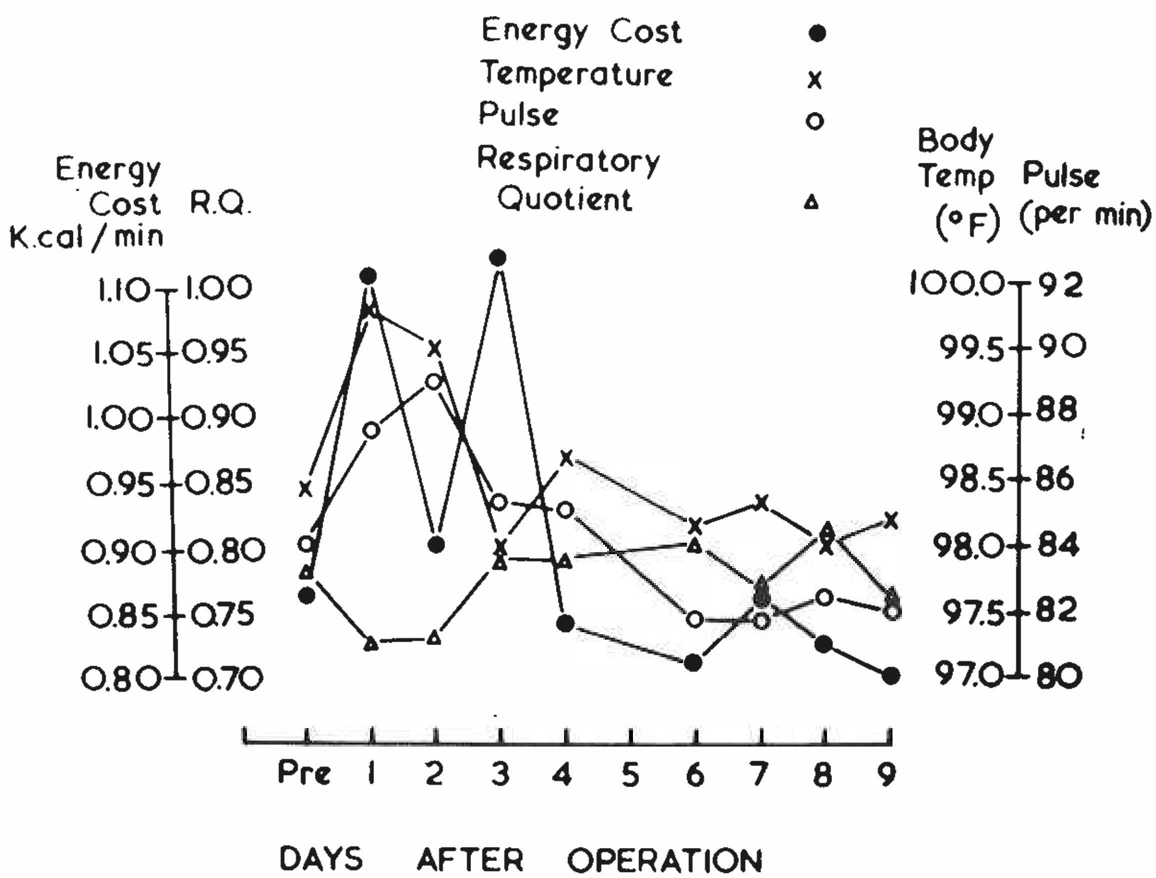

Fig. 2. Energy cost (rest), body temperature, pulse rate, respiratory quotient after operation. (average of 4 patients).

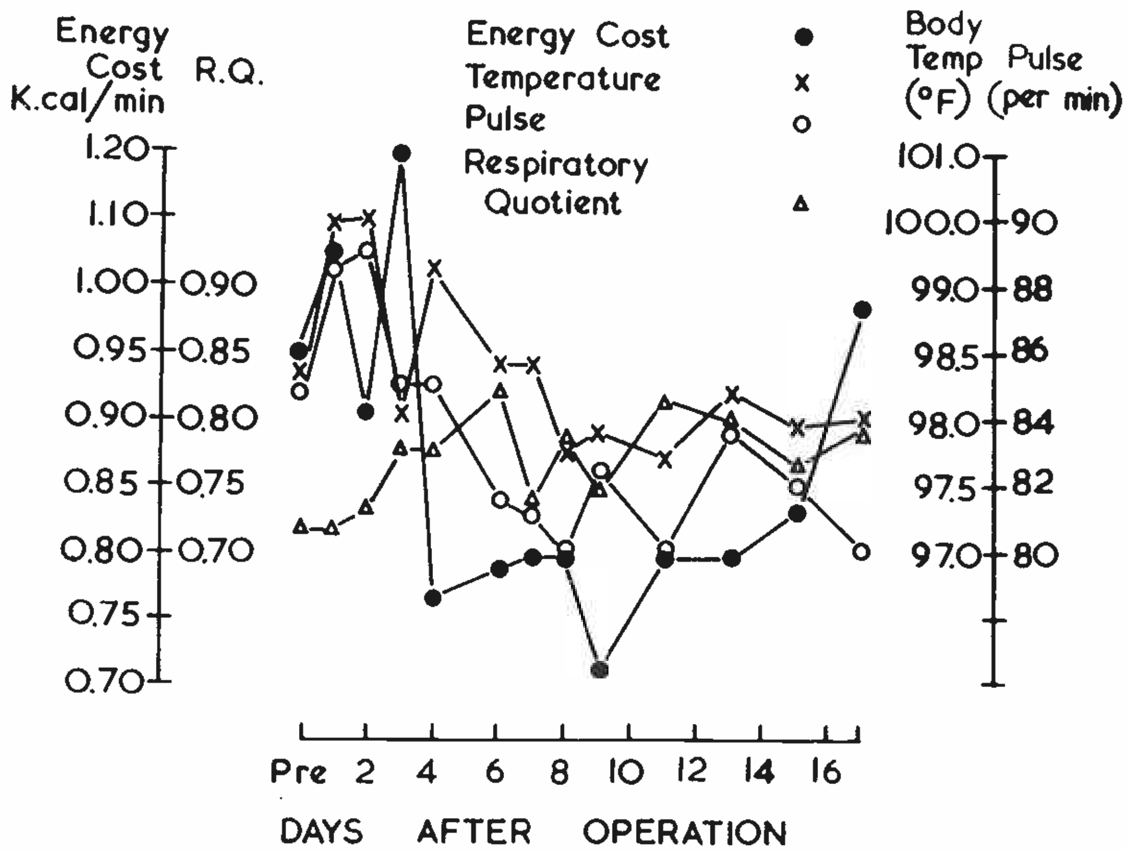

Fig. 3. Energy cost (rest), body temperature, pulse rate, respiratory quotient after operation. (average of 2 patients).

and irregular for the rest of the period, unlike in the other two groups where it remained steady after the initial drop.

It seems from the above that there is an initial increase of resting energy cost on the first few days after the operation, followed by a drop of the energy cost. Further the increase is independent of the increase of body temperature and is proportional to the degree of the trauma. This is in agreement with the results of Cuthbertson (1932) who recorded an increase on the first 3-4 days in the case of elective surgery (menisectomy). Further this corroborates the findings of Cope *et al* (1953) that the increase of resting energy cost is dependent on the degree of trauma in the patients.

The initial drop of respiratory quotients in the first two groups showed that the energy during this period is derived from body fat, which is parallel with the finding of Kenney (1960).

In our earlier study of active tropical female subjects the average daily calorie intake and output were respectively 1742 and 1752 kcals (Banerjee and Saha, 1970). This is 10 per cent below the estimate of Kenney which can be accounted by the lower body weight of tropical women. It may therefore be recommended that in the immediate post-operative period (4 days) and additional intake of 200 kcals making a total of 2000 kcals will be a reasonable estimate for maintenance of calorie-balance in Asiatic women after surgery. Individual cases should be judged by its own merit considering the patients' weight, nutrition and the intensity of trauma.

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